



Road & Bridge Design Publications

Monthly Update – July 2021

Revisions for the month of **July** are listed and displayed below and will be included in projects submitted for the **November** letting.

E-mail road related questions to MDOT-Road-Design-Standards@michigan.gov.

E-mail bridge related questions to MDOT-Bridge-Design-Standards@michigan.gov.

Road Design Manual

4.05.10: Hydraulic Analysis Data and Soil Borings on Plans: Revised a section reference and a division/department reference (DEGLE).

6.03.05: Adjusting Drainage Structures & Utilities: In subsections C & F, revised the pay items for adjusting structures and monuments to match the new Standard Specifications for Construction.

6.03.16C: HMA Curb Pay Items: Revised the pay item for HMA curb to match the new Standard Specifications for Construction.

6.04.04H: Miscellaneous Concrete Pavement: Eliminated an obsolete pay item.

6.04.12E: Patching Pay Items: Eliminated an obsolete pay item.

6.04.12E3: Pavt Repr, Nonreinf Conc: Eliminated an obsolete pay item from the title of the subsection.

6.04.12E6: Early Open to Traffic: Revised the title of the subsection from “Cement” to “Early Open to Traffic” and updated concrete/expedited curing information to current practice.

6.04.12E7: Non-Chloride Accelerator: Eliminated subsection and moved current practice regarding accelerators and expedited curing to 6.04.12E.6 (Early Open to Traffic).

6.06.04: Curb Types: Updated pay item to Curb and Gutter, Conc, Detail C, Modified.

7.04.06: Plan Sheets, Standards Referencing, and Witness, Log, \$1250.00: Updated the pay item Witness, Log, \$1000.00 to Witness, Log, \$1250.00.

7.04.07: Recessing Permanent Pavement Markings: Added a statement specifying the types of recessed pavement markings.



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Bridge Design Guides

6.20.03 A & 6.20.04 B: Added an extra arrow (designation) for the use (locations) of polyethylene and the use of two 0.015” (15 mils) thick layers. This is done to draw even more importance to the change in detailing and construction of approach slabs. Guide 6.20.04 also details polyethylene layers, but the guide was not updated. The original update was in December 2019 and took effect with April 2020 lettings.

Updates to the MDOT Cell Library, Sample Plans, and other automated tools may be required in tandem with some of this month's updates. Until such updates can be made, it is the designer's/detailer's responsibility to manually incorporate any necessary revisions to notes and plan details to reflect these revisions.

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4.05.10 (revised 7-26-2021)

Hydraulic Analysis Data and Soil Borings on Plans

See Drainage Manual Appendix 6-B.

If either the size or location of the culvert are changed, the Road Design Unit must obtain new approval from the Design Engineer - Hydraulics. A plan sheet should be included in all projects showing the project drainage (see Section 1.02.04). All drainage structures should be accompanied by a tabulation of drainage data shown on the Drainage Map. For drainage areas equal to or greater than two square miles, or design discharge in excess of 500 cfs, the tabular form illustrated below is required and can be obtained from the Design Engineer – Hydraulics. For all other culverts, the tabulation must include the design flood frequency discharge and the drainage area.

Soil borings must be requested from the Geotechnical Services Unit for any new or extended culverts that have the following sizes **or equivalent area**:

- Pipe culverts equal to or greater than 60" diameter
- Box and slab culverts equal to or greater than 4' x 4'

For culverts smaller than these sizes, the soil borings must be requested from the Region/TSC Soils and Materials Engineer (see Section 14.25). All soil borings and related information must be shown on the plans.

4.05.10 (continued)

SAMPLE TABULATION FOR DRAINAGE AREAS ≥ 2 square miles OR DISCHARGE > 500 cfs

SUMMARY OF HYDRAULIC ANALYSIS							
FLOOD DATA	EXISTING CONDITION			PROPOSED CONDITION			
	DISCHARGE (cfs)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE (ft)	VELOCITY AT D/S FACE (fps)	WATER SURFACE ELEV. AT U/S FACE OF STRUCTURE (ft)	VELOCITY AT D/S FACE (fps)	WATERWAY AREA (ft ²) AT D/S FACE	CHANGE IN WATER SURFACE ELEV. <u> </u> feet U/S OF PROPOSED STRUCTURE (ft)
50-YEAR							
100-YEAR							
500-YEAR							

NOTES:

- The drainage area contributory to this crossing is _____ square miles.
- The water surface and/or energy grade elevations shown on the above hydraulic table are to be used for comparison purposes only and are not to be used for establishing a regulatory floodplain. The elevations may be used provided they are verified with the Water Resources Division, Michigan Department of Environment, Great Lakes, and Energy.

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CHAPTER 6 SURFACING AND SHOULDERS INDEX (continued)

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- 6.04.09 Widening of Existing Concrete
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- 6.04.10 Concrete Tapers
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6.03.04B (continued)

Surface Preparation

15. Wedging

Wedging is used to build up insufficient areas in the existing surfacing, such as to increase insufficient crown, to increase superelevation, or to level out sags that distort the profile. While the regular HMA surfacing can be thickened to take out up to 1" of sag, wedging, as a separate operation, must be used for thicker modifications.

Wedging shall be 3" or less using the same HMA mix as the top course of the mainline pavement. Additional wedging can be accomplished with variable thickness in the leveling and/or base course.

16. Scratch Coat

An 80 lbs/syd (about $\frac{3}{4}$ " thick) scratch coat is usually required whenever a pavement is cracked and seated, or the existing HMA cap is removed from a composite pavement and the exposed concrete surface has joint and surface deterioration. This is to prevent ravelling of the old concrete under traffic, and possibly a rolling ride when the finished pavement is in place. The material is similar to an HMA leveling course, perhaps modified to use a different size aggregate, computed in addition to the regular rate of resurfacing proposed for the project. If, for some reason, the scratch coat needs to be thicker (as recommended at the Plan Review Meeting) then consideration should be given to reducing the regular leveling course by the additional application rate in excess of the nominal 80 lbs. A scratch coat should be provided on all such applicable projects unless it is specifically deleted at the Plan Review Meeting.

6.03.04B16 (continued)

A scratch coat can also be used to fill longitudinal irregularities such as rutting or faulting between lanes. Scratch coat quantities should be shown separately from the regular resurfacing quantities, and designated as "scratch coat", e.g. HMA, LVSP (Scratch Coat).

6.03.05 (revised 7-26-2021)

Adjusting Drainage Structures and Utilities

It is the practice of the Department to adjust the elevation of manhole and catch basin covers to fit the finished elevation of proposed resurfacing. Designers should therefore provide quantities for this adjustment, but with the knowledge that site by site decisions will be made on construction relative to tapering the surfacing down (or up) to meet the cover at its existing elevation. Depressed covers, e.g., possibly as much as 1" low, can sometimes be tolerated in the gutter, and a manhole cover in the center of a lane that is $\frac{1}{2}$ " low may not pose a problem. On the other hand, a cover in the lane wheeltrack that is $\frac{1}{2}$ " low will be a constant annoyance to the motorist. Some local agencies, for reasons of economy, will shape the new HMA to fit the existing elevation of the cover even if it is $1\frac{1}{2}$ " to 2" low. This practice may be acceptable on low volume, low speed residential streets, but it is not acceptable on a street designated as trunkline.

A. Adjusting Drainage Structure Covers

The item of "adjusting" applies where the elevation of the cover is changed 6" or less. It applies to manhole covers, whether drainage or utility, inlets, and to catch basin covers. While adjustment is usually upward, it can apply where the cover is lowered as well, as might occur in a widening situation.

If the existing structure is in poor condition, it should be reconstructed.

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6.03.05C (continued)

Adjusting Drainage Structures and Utilities

The pay item “**Dr Structure, Adj, Add Depth**” is measured per foot beginning 6” from the level of the existing structure (in the direction of adjustment) to the limit of the additional depth of adjustment. This also requires payment for, “Dr Structure Cover, Adj, Case ___”.

If a new cover is required in conjunction with an Adjustment it is paid for separately. Also, see **Standard Specifications for Construction** for details.

D. Adjusting Water Shutoffs and Gate Boxes

The pay items “Water Shutoff, Adj, Case ___” and “Gate Box, Adj, Case ___” measured as each, should be set up as applicable. Case 1 refers to structures located in hard surfaced travel areas and unit prices includes saw cutting, removing and replacing existing pavement, curb, or curb and gutter, and adjusting the water shutoff or gate box to final grade. Case 2 refers to structures located outside existing pavement, curb, or curb and gutter and unit prices includes restoring disturbed vegetated or sidewalk areas.

E. Facilities Owned by Private/Public or Municipal Utility

Manholes, shut-off valves, etc. owned by a private/public or municipal utility that require adjustment or reconstruction **may** be altered by the facility owner. The facility owner should be contacted to discuss whether they want to adjust the facility or have the MDOT contractor do this work. The designer should coordinated efforts with the Region/TSC utility coordination engineer for contacting the effected utility. If the work will be done by the utility, such structures should be referenced by a note on the plans to the effect that the work will be done by others. The Region/TCS utility coordination engineer should include language regarding this work in the projects utility coordination clause.

6.03.05 (continued)

F. Adjusting and Placing Monument Boxes

Payment for installing or adjusting monument boxes in paved areas will be according to the current specifications for “**Monument Box Adj**” or “**Monument Preservation**”.

In addition, it is required that all monument boxes be adjusted whether shown or not. To ensure that all government corners are adjusted or preserved, the designer shall place the following note on the plans or in the log of any project that includes section or quarter corners.

It is the intent that all government corners on this project be preserved and that, where necessary, monument boxes be placed or adjusted whether shown or not.

Monument box castings are furnished by the contractor according to Standard Plan R-11-Series.

If a Design Unit has a resurfacing project to design without benefit of a survey, the Design Engineer should check with the Survey Section to determine if a pickup survey to locate monument boxes could be made within the time available to complete the plans.

Designers may encounter monument boxes in existing pavements at previous survey or construction control points. On a major reconstruction project these monuments probably need not be preserved, whereas on a resurfacing job, a quantity should be set up to adjust or place new boxes. The Lansing Survey Unit should be contacted by the Design Unit whenever these points are encountered on a project.

For additional information concerning monumentation, see [Section 5.14](#).

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6.03.15 (continued)

HMA Approaches and Auxiliary Lanes

6. Use High Stress HMA Approach for the circulating lanes and the entry and exit legs of a roundabout to the point where the roadway returns to the normal approach road width.
7. Sand trails, such as are frequently encountered in the northern part of the state, should have minimal HMA approaches. Approach Treatment Detail I is typically used in these areas (see [Section 12.02.03](#)).

See [Section 12.02.03](#) details of approaches.

6.03.16 (revised 7-26-2021)

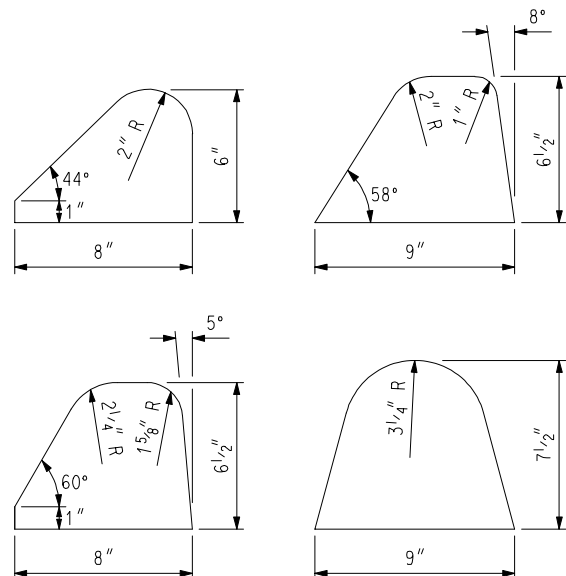
HMA Curb

A. Guideline for Use

The use of HMA curb on trunkline projects should be restricted to replacement in kind, work of a temporary nature, or for maintenance-type erosion control at the edge of shoulder.

B. Curb Shapes

The **Standard Specifications for Construction** indicate that HMA curb shapes will be according to the cross-section shown on the plans. Shown below are four shapes, based on commercially available templates that have been adopted by the Department. The shape to be used must be detailed on the plans or in the proposal.



C. Pay Items

Designers are reminded that the pay items are "Curb Slp, HMA" and "Curb Vertical, HMA".

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6.04.03 (continued)

Characteristics of Concrete Pavement

Concrete pavement has a tendency to curl upward when saturated by moisture on the underside or when the temperature of the top surface is lower than that at the bottom. This tendency is most evident at night and is manifested in greater pavement edge deflection due to curl.

Concrete pavement has a tendency to lose its ability to accommodate expansion over the years, which is evidenced by open joints that don't close up when warmer temperatures return. This is usually the result of dirt and incompressibles entering joints and cracks and effectively filling up any available expansion space, or from actual expansion of the concrete due to alkali-silica or alkali-carbonate reactions and/or freeze-thaw deterioration. This phenomenon can have serious consequences when, for example, it results in excessive expansion pressures on the backwall of a bridge, or causes blow-ups at weakened pavement joints.

Admixtures can change the characteristics of portland cement concrete, particularly during the casting and setting stages. Plasticizers can increase the slump, and thus the workability, without changing the water-cement ratio. Calcium chloride will increase the heat of hydration, important in the winter time to allow the mix to set up without freezing. It is also used to accelerate the setting, therefore resulting in obtaining higher strength faster and allowing the roadway to be opened to traffic sooner. However, chlorides cause corrosion of reinforcement, so this material should not be used in heavily reinforced structures or those where corrosion will excessively reduce the life of the pavement. Extra cement and/or alternate non-chloride chemical additives can be used for fast strength gain when needed for reinforced concrete.

6.04.04 (revised 7-26-2021)

Concrete Pavement

A. General

Michigan has constructed three types of concrete pavement in past years. These are: Jointed Reinforced Concrete Pavement (JRCP), Jointed Plain Concrete Pavement (JPCP) and Continuously Reinforced Concrete Pavement (CRCP). JRCP and JPCP have been widely used while CRCP has been used in the past.

B. Thickness

Conventional thicknesses of concrete pavement range from 8" to 12" uniform. Many Metro area freeways were built utilizing 10" thickness and there are many rural trunklines 8" thick.

Some older pavements placed prior to 1950 were constructed with variable thicknesses. For example, a 9"-7"-9" pavement is 9" thick at each outside edge, tapering to 7" thickness 3' in from the edges. When rehabilitating a concrete pavement of this era, the designer should be aware of this possible design. Pavement cores can confirm or deny this situation if old plans do not exist.

Pavement thicknesses greater than 9" are usually required only on the freeway system. The Pavement Designer will make the thickness determination.

C. Section Deleted

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6.04.04 (continued)

Concrete Pavement

G. Joints in Latex Concrete Bridge Approaches

When bridge decks and their approaches are resurfaced with latex concrete, the joints in this approach wedging must be detailed in the plans. Latex concrete is used on approaches, rather than HMA, when the approach concrete is in good condition. Usually there is a series of expansion joints in this area.

Provision must be made to continue the function of the underlying pavement joints through the overlay. The seals in the expansion joints should be removed and the joints resealed. The sketch shown below is to be detailed on the plans when this treatment is used.

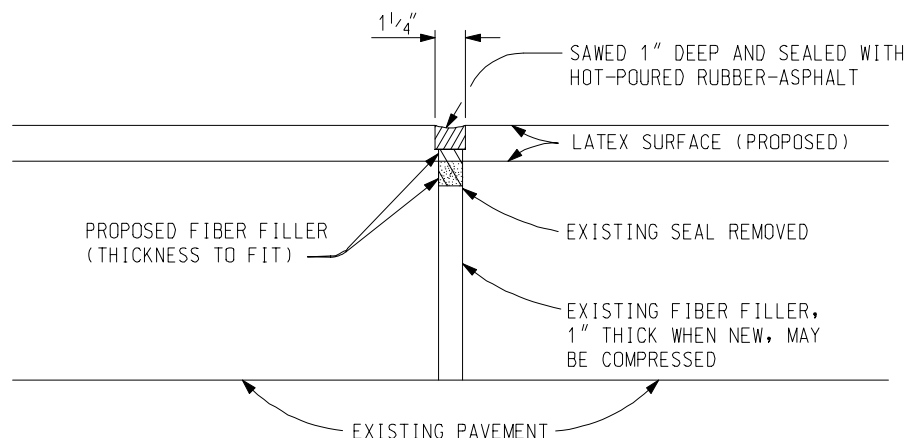
The longitudinal joints should also be matched, with a bond breaker such as duct tape placed between the latex pours to continue the joint through the overlay. The joint should then be sawed and sealed as shown for symbol "B" on Standard Plan R-41-Series.

6.04.04 (continued)

H. Miscellaneous Concrete Pavement

The pay item for Miscellaneous Concrete Pavement is Conc Pavt, Misc, Nonreinf __ inch. The pay item is intended to compensate the contractor for the additional cost involved with low production paving and to allow the use of modified equipment and construction methods, when appropriate. Low production paving may be odd or variable width or of limited quantity. Modified equipment and construction methods are warranted when the length of paving is too short for the effective use of a full paving train.

There is no rigid criteria for determining when and how much Miscellaneous Concrete Pavement should be used on a project. The plans or proposal should therefore clearly designate which areas of pavement will be paid for as Miscellaneous. Examples of it are intersection betterment projects, speed change lanes (including uniform width as well as tapered sections), ramps, and collector-distributor roads even though they may include uniform pavement widths exceeding 500' in length.



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6.04.12 (revised 7-26-2021)

Concrete Pavement Patching

A. References

See Standard Plan R-44-Series, "Concrete Pavement Repair". Also see [Section 6.03.04B](#), Concrete or Composite (HMA on Concrete) Pavement.

B. General

It is preferable to delay a first-time resurfacing of a concrete pavement as long as possible by patching and joint repair. As the emphasis has shifted from large scale new construction or relocation to improving and expanding the existing trunkline system, and maintaining it, patching and joint repair projects have taken an increasingly larger share of construction dollars.

It is difficult to separate patching from joint repair. Except for construction-induced pavement and base deficiencies, most deterioration of a pavement occurs at the joints, primarily in the transverse joints and, to a lesser extent, in the longitudinal joints and deteriorated transverse cracks.

6.04.12 (continued)

C. Distances Between Concrete Patches

The minimum distance between patches should be 8', according to the ***Standard Specifications for Construction***. If less than 8' between repairs, the entire section of old pavement should be removed and a longer repair constructed. A note should be included in the plans to this effect. Some judgement should be used, however; if the designer frequently finds that the minimum distance between patches criteria is being encountered, it may indicate that the wrong "fix" has been chosen for the project.

Too many patches per mile is objectionable for two reasons:

1. The motorist visually perceives the pavement to be in bad condition and thus may expect a poor ride even though the patches may actually be quite smooth riding.
2. Excessive patching may indicate that the wrong treatment has been selected and that the money spent on patching could have been better utilized if contributed toward a different type of rehabilitation. A study prepared by Gerald T. Luther in February 1989 concluded that, using a life cycle analysis, about 75 patches per lane mile equates in cost to about 4" of HMA resurfacing over a 20-year life span. The HMA project, however, would be ready for total rehabilitation at the end of the 20 years whereas the patched project would still have about seven years of useful life remaining. The Engineering Operations Committee, on March 21, 1989, decided that for design purposes, patches should be limited to a maximum of 60 repairs per lane mile.

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6.04.12 (continued)

Concrete Pavement Patching

D. Expansion Space to be Provided

Unless the pavement being repaired is to be HMA overlaid, patches and joint repairs should provide 1" of expansion space in 1000' of pavement. Expansion space is provided by use of Expansion Joint, Erg.

In general, it is preferable to disperse expansion space throughout a project than to concentrate joints at one location. Since most old expansion joints are bound up, providing less than full width relief will only compound the problem. Where the existing joint is an expansion joint, provide a new Erg across all lanes to provide uniform relief. (Do not use an E2 and match the existing joint.) Care must be taken to choose locations where the Expansion Joint, Erg can be placed across all lanes.

E. Patching Pay Items

The more common pay items applicable to a patching project are:

Pavt Repr, Rem	Square Yard
Saw Cut, Intermediate	Foot
Pavt Repr, Noneinf Conc, ___ inch	Square Yard
Lane Tie, Epoxy Anchored	Each
Joint, Contraction, Crg	Foot
Joint, Expansion, Erg	Foot
Joint, Expansion, Esc	Foot
Joint, Tied, Trg	Foot
Cement	Ton
Non-Chloride Accelerator	Gallon

6.04.12E (continued)

The following notes clarify the use of these items:

1. Pavt Repr, Rem

The pay item of Pavt Repr, Rem applies to pavement removals from 4' (the minimum length of a patch) to 100' long. Removals more than 100' long are paid for as Pavt, Rem. Removal of concrete shoulders, curb, curb and gutter, and valley gutter are paid for using the same pay item as used for the adjacent pavement.

It should be noted that Pavt, Rem carries no restriction regarding disturbance of the underlying base, whereas Pavt Repr, Rem does carry a prohibition against disturbing the base, so as to require sawing and lifting methods. Pavement removal for utility cuts, even though unavoidably disturbing the base, should be paid for as "Pavt Repr, Rem.

If the thickness of the old pavement being removed results in the base being more than 2" low, the contractor will be required to bring it up to proper elevation with aggregate. (Concrete would be permitted but payment will be limited to that for aggregate) If the base is 2" low or less, or is low as a result of the contractor's removal operation, the contractor must fill the deficiency with concrete at his/her expense. Any disturbed base must be recompacted before casting the patch, otherwise settlement will occur.

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6.04.12E (continued)

Concrete Pavement Patching

2. Saw Cut, Intermediate

Because the pay item Pavt Repr, Rem prohibits disturbing the base, the contractor must lift out the old pavement that is to be replaced. This in turn requires that it be cut up into 6' long slabs of a lane width, (a convenient size that will fit a dump truck.) Most repairs occur at a joint or crack where the pavement segment will break into two pieces anyway, but for longer repairs we compensate the contractor for the cost of sawing the old pavement up into 6' lengths. For estimating purposes, designers should assume that approximately 75% of the repairs in the over 6' to 12' range will require one intermediate saw cut. Ten percent of the 6' patches should also be set up for an intermediate saw cut. Patches longer than 12' (but not exceeding 50') should be set up for one saw cut every 6'.

6.04.12E (continued)

3. Pavt Repr, Nonreinf Conc

The pay item depth for repairs is based on the plan thickness originally specified for the existing concrete pavement plus 1".

If the length of the repair is 100' or less, the replaced pavement is paid for as Pavt Repr, Nonreinf Conc, ___ inch. If the repair is greater than 100' in length, the replaced pavement is paid for as Conc Pavt, Misc, Nonreinf, ___ inch.

The texture of the repair should approximate that of the adjacent pavement, e.g., a heavily tined patch in a comparatively smooth textured pavement would not only accentuate the perception of a patched pavement but would provide an audible and tactile discontinuity as well.

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6.04.12E (continued)

Concrete Pavement Patching

4. Lane Tie, Epoxy Anchored

Epoxy anchored lane ties shall be used between the adjoining lanes of full width pavement repairs where the distance between joints exceeds 15' and shall be spaced according to Standard Plan R-41-Series. Single-lane pavement repairs, one slab length or longer shall use "Lane Tie, Epoxy Anchored" for that portion of the repair between the joints of the existing pavement. Single-lane repairs greater than 15' that are located on curves with radii 3800' or less shall also be tied to the adjacent slab. Do not install epoxy anchored lane ties in the offset portion of a tangent repair unless the end aligns with an existing joint or working crack. See Standard plan R-44-Series and [Section 6.04.12F](#) for more detailed information.

6.04.12E (continued)

5. Joint Types

Repairs made in jointed concrete pavements shall be doweled and grouted unless otherwise directed by the Engineer. The transverse joint types used (Tied Joint, Trg, Contraction Joint, Crg, and Expansion Joint, Erg) are specified on Standard Plan R-44-Series. When the repair includes a curb and gutter and an Expansion Joint, Erg, an undoweled Expansion Joint, Esc shall be placed in the curb and gutter portion of the repair.

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6.04.12E (continued)

Concrete Pavement Patching

6. Early Open to Traffic

When requirements for opening to traffic necessitates faster concrete cure times, concrete pavement restoration according to the Standard Specifications for Construction prescribes the use of Grade P-NC concrete. Its use is based on anticipated cure time and minimum flexural strength.

The Engineer may additionally approve the use of Non-chloride accelerators to speed up the setting of concrete. They are used to achieve the shorter end of the intended opening to traffic times for Grade P-NC concrete. When early opening to traffic is anticipated, include a pay item and quantities for Non-chloride Accelerator. For quantities, estimate two gallons per cubic yard of concrete.

6.04.12 (continued)

F. Typical Joint Layouts for Concrete Repairs

Concrete pavement repair joint layouts are detailed on Standard Plan R-44-Series to assist the designer in selecting joint types, their location, and placement of lane ties. The designer is responsible to clearly detail the joint layouts on the construction plans. There may be situations where these layouts do not cover a certain situation therefore, judgment must be used to decide the proper layouts.

An Expansion Joint, Erg may be used on the departing joint where a Contraction Joint, Crg is illustrated in the layouts on Standard Plan R-44-Series, but only when expansion is needed and when the joint repair extends across the entire pavement, including adjoining concrete ramps or shoulders. See [Section 6.04.12D](#) for maximum allowed expansion space in a given distance.

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6.06.03

Purpose of Curb and Gutter

Curbs serve primarily to (1) control and direct drainage runoff, and to (2) visibly and physically define the edge of the traveled way. Curbs are used primarily in urban or semi-urban areas. Curbs are not needed in rural areas where flush shoulders are used as a vehicle refuge and safety area immediately adjacent to high speed traffic and where open ditches can be utilized for roadway drainage. Curbs serve other corollary purposes, such as promoting the aesthetics of an orderly roadside development, defining points where vehicles may leave the roadway, and, in some cases, allowing the widest possible roadway use in a restricted right of way.

6.06.04 (revised 7-26-2021)

Curb Types

Department concrete curb types are shown on Standard Plans R-30-Series and R-33-Series. Details B and D are considered mountable or roll curbs, while Details C, E and F are considered barrier curbs. See further discussions of barrier curbs under Section 6.06.05.

While most curb, used for the purposes described under Section 6.06.03 above, are constructed of portland cement concrete, HMA curbs are sometimes used. See [Section 6.03.16](#).

Some of the earlier city streets in Detroit will have cut stone curbs. These are usually granite blocks, about 4' long, and would be classified as straight curbs. Whenever these curbs must be removed, they are usually replaced with our current designed concrete curbs, unless, for some reason, it is wished to retain the "old" character of the stone curb by salvaging them for re-setting and re-use.

6.06.04 (continued)

Whenever it is necessary to modify a standard type of curb to fit a particular situation, the word "modified" must be included in the pay item, and the curb must be detailed on the plans. An example would be to have a Detail C curb gutter slope **away** from the curb face. It would be called "**Curb and Gutter, Conc, Detail C, Modified**". If the change is of greater magnitude and the curb bears little resemblance to one of the standard curb details, then the reference words "barrier" or "roll" could be inserted in the pay item, as applicable, in place of a detail (letter) designation.

6.06.05

Barrier Curb

With particular reference to Detail F curb and gutter, there has been some blurring of the distinction between a barrier and a mountable curb. The Department considers Detail F to be a barrier curb because of its nominally vertical curb face.

Use of the word "barrier", in reference to a curb, should never be construed as meaning that the curb will provide a means of preventing a vehicle from progressing beyond the line of the curb. A vertical-faced curb approaching 9" or 10" in height will be somewhat effective in vehicular redirection at reduced angles of impact in the lower speed range.

For curb types and application, see [Section 6.06.06C](#).

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CHAPTER 7 APPURTENANCES INDEX (continued)

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7.06 FENCING

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- 7.06.10 Fencing Borrow Area Lakes and Retention Basins

ROAD DESIGN MANUAL ROAD DESIGN

7.04.04 (revised 10-22-2018)

Removing Permanent Pavement Markings

See the Work Zone Safety and Mobility Manual, [Section 6.01.13A](#) - Pavement Marking Removal.

7.04.05

Statutory Participating Cities

Statutory participating cities are exempt from participating in the cost of permanent pavement markings.

7.04.06 (revised 7-26-2021)

Plan Sheets, Standards Referencing, and Witness, Log, **\$1250.00**

Most projects call for the placement and/or replacement of permanent pavement markings. To ensure the markings are laid out properly the Designer must include information in the plans or proposal to allow a Contractor to do so.

Markings are placed or replaced using one or a combination of the following methods:

- A log of previously witnessed markings
- Reference to standard plans (only if the standard can be placed in the field)
- Pavement marking plan sheets

When the roadway will not be geometrically or functionally altered by construction (no addition or removal of turn lanes, no change in passing and no passing zones, no addition or removal of signals, etc.) and the markings should be returned to their pre-construction configuration, marking layout can be addressed through the use of the pay item Witness, Log, **\$1250.00**. Use of Witness, Log, **\$1250.00** requires the Contractor to witness and log any existing pavement markings prior to the markings or pavement being removed, and to lay the markings back out after construction. The Engineer should have the opportunity to review the pavement marking layout prior to placement and make any necessary changes, however if changes are anticipated plan sheets should be included in the project documents.

ROAD DESIGN MANUAL ROAD DESIGN

7.04.06 (continued)

While the applicable pavement marking standard plans should be listed in all contracts with markings, use of solely the standards for pavement marking establishment is only acceptable in a few situations. The standards do not address lane and shoulder widths, turn lane storage lengths, precise stop bar setbacks, and many other variables needed for marking layout, so virtually all projects should include either plan sheets or Witness, Log, \$1250.00. Some of the exceptions to this where referencing the standards would be sufficient are bridge-specific projects (deck and/or approach work) and pavement patching projects, where the Contractor is only being asked to reconnect lines that they can see both ends of.

Plan sheets should be included if neither of the above options will adequately address the pavement marking layout needs of a project. When only a portion of a project will require changes from the existing pavement marking configuration (addition of a turn lane, correcting a section of markings that do not meet standards, etc.) it is acceptable to include plan sheets for only the portion requiring changes and utilize Witness, Log, \$1250.00 for the remainder of the project.

7.04.07 (revised 7-26-2021)

Recessing Permanent Pavement Markings

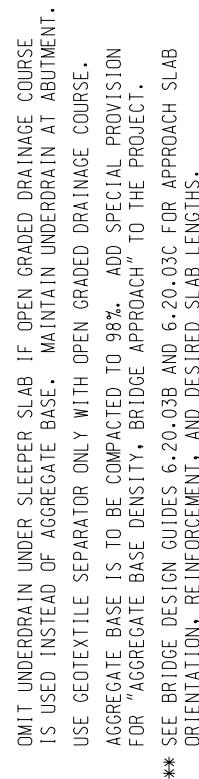
To increase life expectancy pavement markings can be placed in a recess (groove) rather than on the pavement surface. Recessing provides protection from snowplow blades and also resistance to shearing forces from traffic passing over the markings.

All longitudinal permanent pavement markings placed with 3R/4R construction projects must be recessed, regardless of the pavement marking material used. Areas of exception are bridge decks, markings placed in a rumble strip, roadway sections that are candidates for road diets, and where markings are placed in pilot configurations (e.g. – where a road diet is installed but may be reversed). Recessing for special markings and on project types other than 3R/4R is at the discretion of the Engineer.

While recessing does aid the durability of all marking types, careful consideration must be given when recessing many styles of special markings. The groove created for the material can trap water and debris, resulting in potential hazards where motorcycles, bicycles, and pedestrians cross over the markings. As a result recessing is generally not recommended for symbols and legends, and when considering recessing for stop bars and crosswalks the Engineer should evaluate marking durability concerns against user types and volumes.

Recessed marking pay items are specified as being either longitudinal, transverse, or guide line. Recessing for lane lines, edge lines, centerlines, and gore markings falls under the longitudinal recessing pay item. All special markings, including line-style markings such as stop bars, crosswalks, and cross hatching, utilize the transverse recessing pay item. Turning guide lines (also referred to as lane line extensions, “blips”, or “chicken tracks”) have a separate recessing pay item due to the work and machinery involved.

ISSUED: 07/26/21
SUPERSEDES: 08/24/20



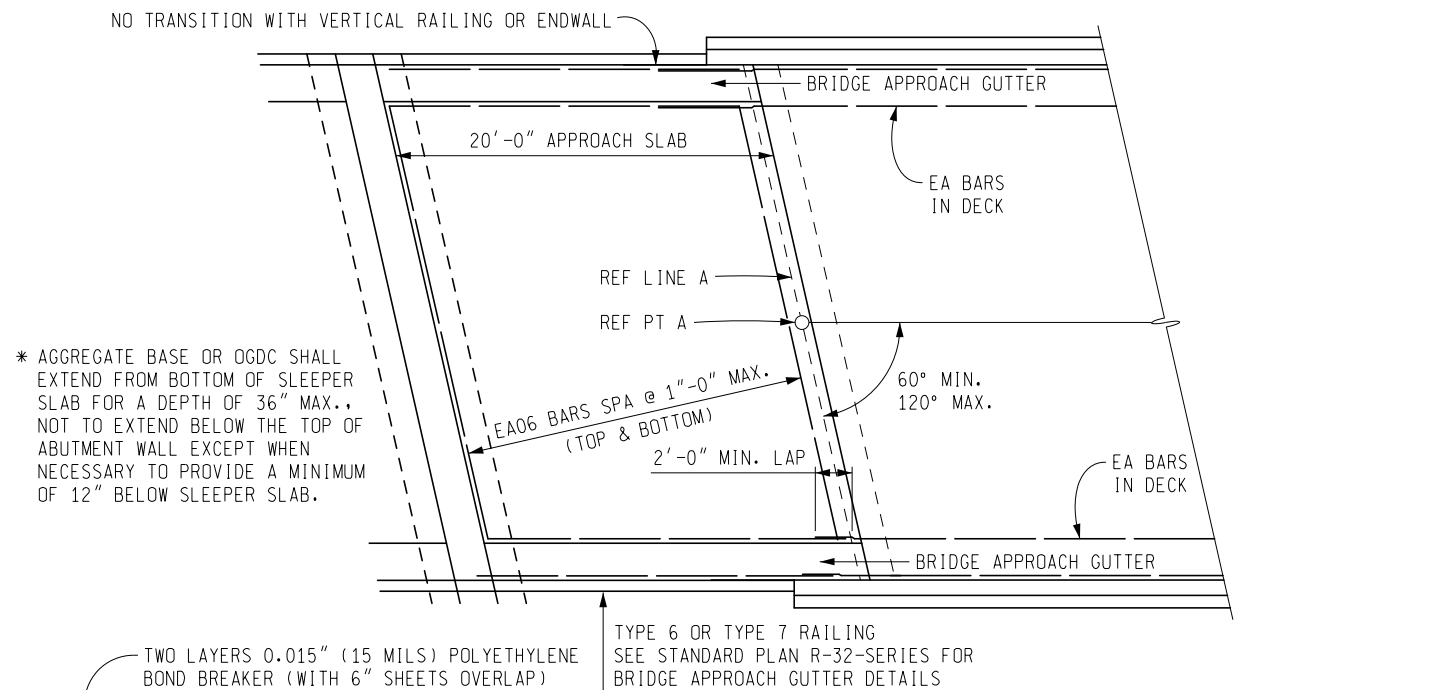
6.20.03A

DRAWN BY: BLT
CHECKED BY: VZ
APPROVED BY: BMW

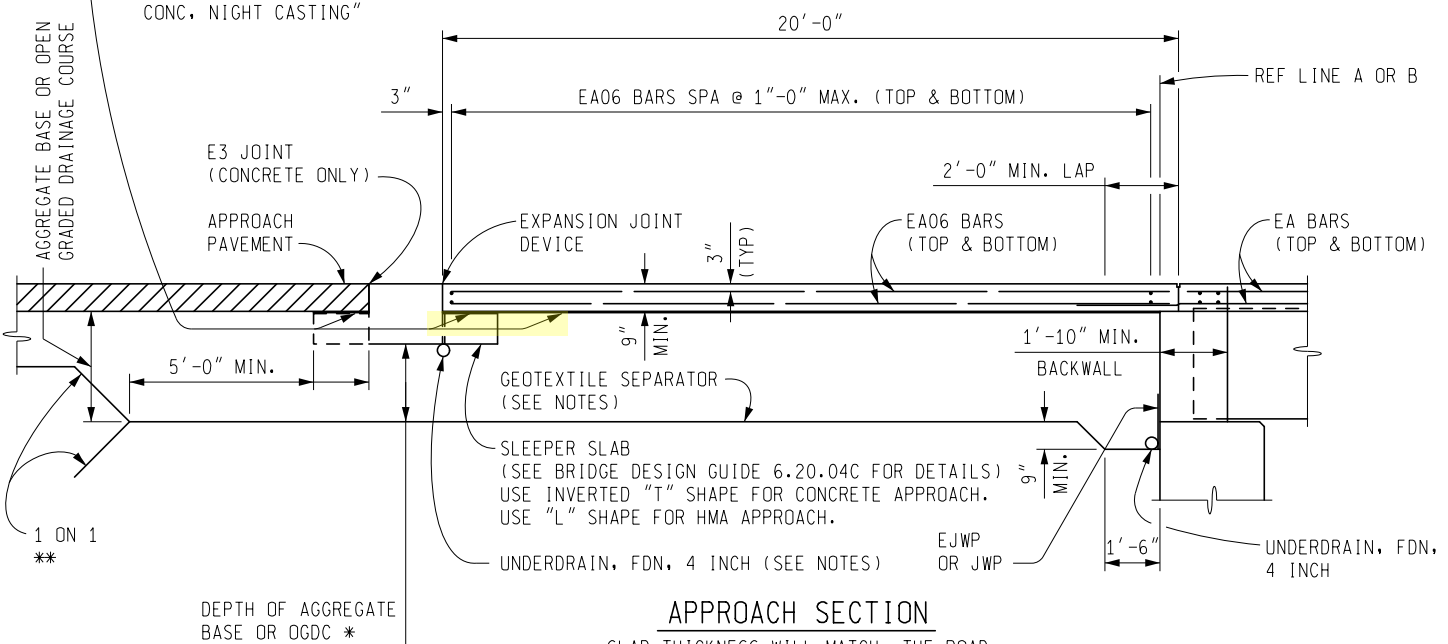
MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT

INTEGRAL AND SEMI-INTEGRAL ABUTMENT
EMPIRICAL APPROACH SLAB DETAILS

ISSUED: 07/26/21
SUPERSEDES: 12/16/19



PLAN OF APPROACH



APPROACH SECTION

SLAB THICKNESS WILL MATCH THE ROAD
APPROACH PAVEMENT THICKNESS (9" MIN.)

NOTES:

ATTACH APPROACH CURB AND GUTTER TO THE APPROACH SLAB WITH BOTTOM MAT TRANSVERSE REINFORCEMENT AND TO THE BRIDGE DECK WITH BOTTOM MAT LONGITUDINAL REINFORCEMENT.

POUR APPROACH SLABS FROM EXPANSION LOCATION TOWARD REFERENCE LINE.

APPROACH SLABS SHOULD BE CAST AT NIGHT WITH NIGHT TIME CASTING OF SUPERSTRUCTURE CONCRETE.

AGGREGATE BASE IS TO BE COMPACTED TO 98%. ADD SPECIAL PROVISION FOR "AGGREGATE BASE DENSITY, BRIDGE APPROACH" TO THE PROJECT.

USE GEOTEXTILE SEPARATOR ONLY WITH OPEN GRADED DRAINAGE COURSE.

OMIT UNDERDRAIN UNDER SLEEPER SLAB IF OPEN GRADED DRAINAGE COURSE IS USED INSTEAD OF AGGREGATE BASE.

USE SLEEPER SLAB WITH ALL APPROACH SLABS INCLUDING HMA ROADWAY.

USE APPROACH SLAB DETAILS ON STANDARD PLAN R-45-SERIES WHEN THE LENGTH OF BRIDGE CONTRIBUTING TO EXPANSION AT AN ABUTMENT IS LESS THAN 50' FOR CONCRETE BEAM BRIDGES AND LESS THAN 25' FOR STEEL BEAM BRIDGES.

** SEE GUIDE 5.46.01 FOR TERMINATION LIMITS OF AGGREGATE BASE OR OPEN GRADED DRAINAGE COURSE.

PLAN NOTE:

DO NOT USE WHEELED, ROLLER BASED OR MACHINE MOUNTED COMPACTION EQUIPMENT TO COMPACT THE SUBGRADE, SUBBASE, AND BASE WITHIN 10' OF THE SLEEPER SLAB AFTER IT IS BUILT. USE ONLY HAND/PLATE COMPACTION. CONTACT PRESSURE OF COMPACTION EQUIPMENT SHALL NOT EXCEED 10 PSI.

PREPARED BY
DESIGN DIVISION

6.20.04B